ORDER POLYGALALES

KEY TO FAMILIES OCCURRING IN FIJI

Stamens usually 10, the filaments usually basally connate, the anthers dehiscing by longitudinal slits (rarely by terminal pores); petals 5, free, usually unguiculate; ovary usually 3-locular; leaves opposite or verticillate (at least in our species); our representatives trees, shrubs, or lianas.
155. MALPIGHIACEAE

Stamens usually 8, the filaments usually connate into a cleft sheath, the anthers dehiscing by apical pores or short subapical clefts (rarely by longitudinal slits); petals 3 (in our genus), basally adnate to filament tube; ovary usually 2-locular; leaves usually alternate; our representative an adventive herb.
156. POLYGALACEAE

FAMILY 155. MALPIGHIACEAE

MALPIGHIACEAE Juss. Gen. Pl. 252, as *Malpighiae*. 1789.

Shrubs, small trees, or frequently lianas, commonly with indument of unicellular, medifixed, eglandular ("malpighian") hairs, usually stipulate, the stipules often inconspicuous, sometimes large and connate, sometimes lacking; leaves usually opposite, sometimes verticillate or subopposite, simple, the petiole or proximal margins of blade often with a pair of large, fleshy glands, the blade entire (infrequently lobed), often gland-dotted; inflorescences terminal or axillary, paniculate or cymose or racemiform, bracteate, the pedicels articulated, bibracteolate; flowers ☿, seldom unisexual by abortion, hypogynous, 5-merous, often obliquely zygomorphic (bilaterally symmetrical), sometimes actinomorphic; sepals free or slightly connate at base, imbricate, often glandular, persistent; petals free, imbricate or contorted, usually unguiculate, the margins often ciliate, dentate, or fimbriate; stamens usually 10 in 2 cycles (sometimes uni- or tricyclic), some of them often without or with abortive anthers, the filaments usually connate at base, the anthers 2-locular (or some of them 1-locular), basifixed or dorsifixed, dehiscent introrsely by longitudinal slits or seldom by terminal pores, the connective sometimes enlarged; disk inconspicuous, infrequently accrescent; ovary (2 or)3(–5)-locular, positioned obliquely to petals, the placentation axile, the ovules 1 per locule, pendulous, hemianatropous, epitropous (with ventral raphe), the styles distinct or only basally connate, rarely fully connate, the stigmas terminal to ventrally subterminal; fruit commonly a schizocarp with winged to nutlike mericarps, these seldom dehiscent, sometimes a nut or a drupe not or tardily separating into mericarps, the seeds with a large, straight to curved embryo, the endosperm none or scanty.

DISTRIBUTION: Pantropical and subtropical, with 55–60 genera and 800–1,200 species. Four genera have been recorded in Fiji, only one of them being represented by an indigenous species.

USEFUL TREATMENTS OF FAMILY: NIEDENZU, F. Malpighiaceae. Pflanzenr. **91, 93, 94** (IV. 141): 1–870. 1928. JACOBS, M. Malpighiaceae. Fl. Males. I. **5:** 125–145. 1955. HUTCHINSON, J. Malpighiaceae. Gen. Fl. Pl. **2:** 569–592. 1967.

KEY TO GENERA

Fruits samaroid, winged; our species lianas or plants with scandent branches.
Flowers zygomorphic; calyx (in our species) with a large posterior gland (this in some species more than one or lacking); petals slightly unequal in shape and size, the innermost one often (as in our species) with 2 basal outgrowths; stamens unequal, the anterior one conspicuously the largest and with a stout filament; ovary 3-lobed, with incipient wings early apparent; fruit with 3 laterally developed wings, the middle one the longest and often (as in our species) with a dorsal crest simulating a fourth wing; stipules minute, glandlike, inserted on branchlets between petioles, or lacking; indigenous.
1. *Hiptage*

Flowers essentially actinomorphic; calyx eglandular or with very small glands; petals equal, dorsally carinate; stamens of the two whorls with unequal filaments; ovary globose; fruit with a lateral wing with 4–10 lobes stellately expanding in one plane, a median wing sometimes also present; stipules small, connate to bases of petioles; cultivated only. ..... 2. *Tristellateia*

Fruits smooth, with unwinged mericarps or pyrenes; our species shrubs or small trees; cultivated only.
Leaf blades with 2 small glands at base; flowers essentially actinomorphic; calyx usually eglandular; stamens alternately slightly unequal; ovary often with 1 or 2 of the 3 locules undeveloped; fruit composed of dehiscent mericarps. ..... 3. *Galphimia*

Leaf blades eglandular; flowers zygomorphic; calyx with 6–10 distinct glands; 2 stamens in a tranverse plane different from the other 8; ovary 3-locular; fruit a fleshy drupe with 3 subcoherent pyrenes.
4. *Malpighia*

1. HIPTAGE Gaertn. Fruct. Sem. Pl. **2:** 169. 1790; Seem. Fl. Vit. 29. 1865; Niedenzu in Pflanzenr. **91** (IV. 141): 67. 1928; A. C. Sm. in J. Arnold Arb. **36:** 280. 1955; Jacobs in Fl. Males. I. **5:** 130. 1955; Hutchinson, Gen. Fl. Pl. **2:** 585. 1967.

Trees or often scandent shrubs or lianas, the stipules minute and glandlike, sometimes lacking, if present free between petioles; leaves opposite, the petioles short, the blades subcoriaceous, entire, usually with 2 basal glands on lower surface, often with smaller, scattered glands beneath; inflorescences terminal and axillary, racemiform or paniculiform, the flowers ☿, dispersed along rachis, zygomorphic; calyx deeply lobed, often with one large posterior gland sometimes decurrent on petiole, the gland convex or (as in our species) concave, in some species lacking or more than one, the lobes obtuse; petals usually obviously unguiculate, slightly unequal in shape and size, the innermost one often with 2 basal outgrowths; stamens unequal, the filaments connate at base, the anterior stamen conspicuously the longest and with a stout filament, the other 9 with slender filaments, the posterior one the shortest; ovary 3-lobed, the incipient wings early obvious and copiously pilose, 2 styles abortive, the remaining style conspicuous, stout, coiled inward and slightly longer than longest stamen, acute, the stigma inconspicuous; fruit samaroid, composed of mericarps and 3 laterally developed wings, these coriaceous to chartaceous, the middle one the longest and at right angles to the 2 lateral ones, a dorsal crest sometimes (as in our species) developing longitudinally on largest wing and simulating a fourth wing, but in some species lacking.

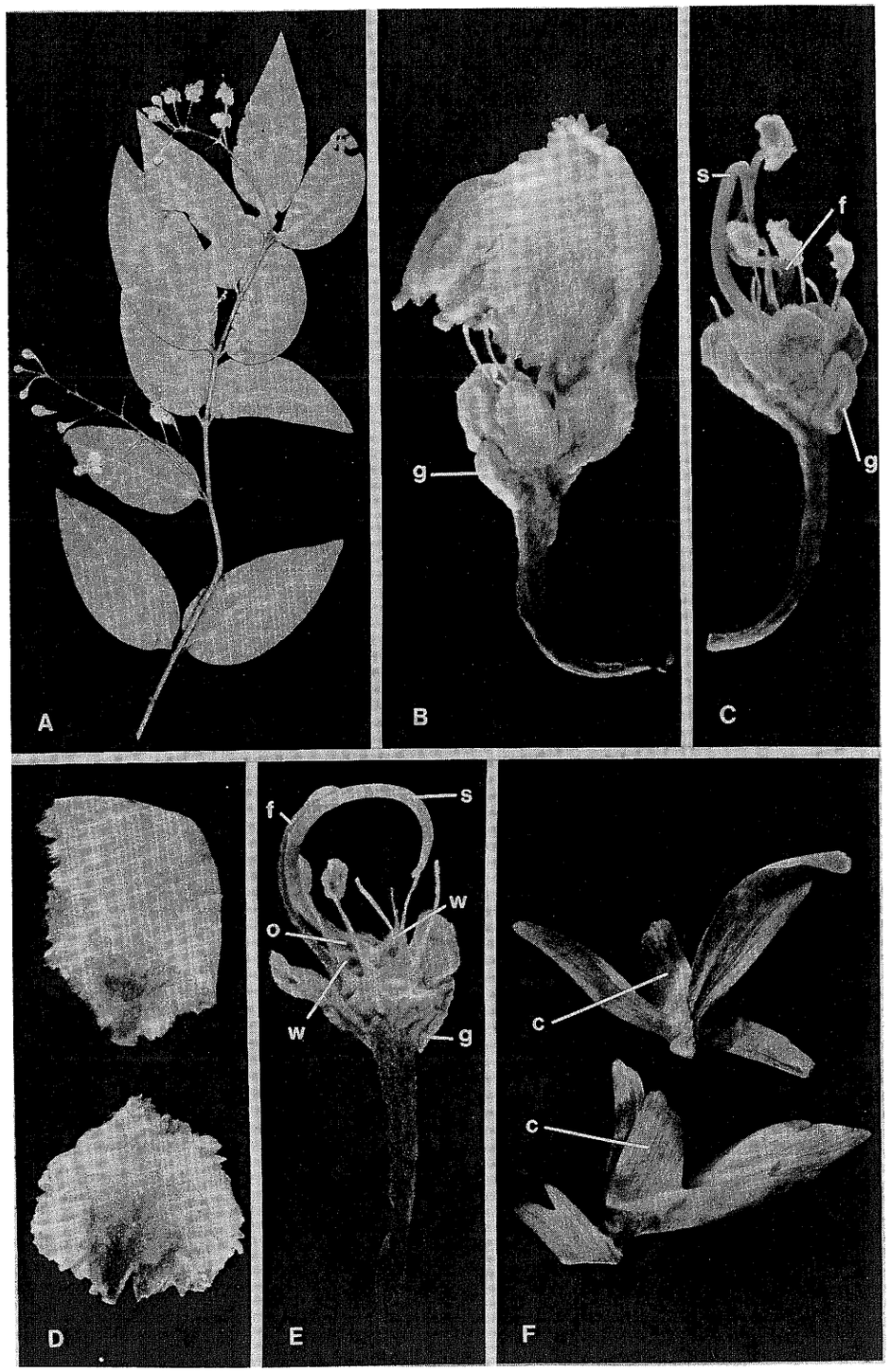
TYPE SPECIES: *Hiptage madablota* Gaertn. (= *H. benghalensis* (L.) Kurz).

DISTRIBUTION: Ceylon, the Himalayas, southern China, and Formosa into Malesia to Celebes and Timor, with a disjunct endemic species terminating the generic range in Fiji, with 20–30 species.

1. **Hiptage myrtifolia** A. Gray, Bot. U. S. Expl. Exped. **1:** 267. 1854, Atlas, *pl. 21.* 1856; Seem. Viti, 434. 1862, Fl. Vit. 29. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 127. 1890; Niedenzu in Pflanzenr. **91** (IV. 141): 84. 1928; A. C. Sm. in J. Arnold Arb. **31:** 288. 1950, in op. cit. **36:** 280. 1955; Jacobs in Fl. Males. I. **5:** 135. 1955; J. W. Parham, Pl. Fiji Isl. 122. 1964, ed. 2. 173. 1972. FIGURE 181.

Hiptage javanica sensu A. Gray, Bot. U. S. Expl. Exped. **1:** 267. 1854; Seem. Viti, 434. 1862, Fl. Vit. 29. 1865; Drake, Ill. Fl. Ins. Mar. Pac. 127. 1890; non Bl.

A shrub or small tree 1–4 m. high, usually with scandent branches, or a high-climbing liana, found from near sea level to about 900 m. elevation in dense, dry, or secondary forest or on its edges; branchlets pale-sericeous but soon glabrate, copiously pale-lenticellate; petioles 3–6 mm. long; leaf blades subcoriaceous to chartaceous, prevailingly ovate, (2.5–) 4–11 × (1–) 1.5–5.3 cm., obtuse to rounded at base, obtuse to acute at apex (rarely with an acumen to 15 mm. long); inflorescences racemose (but on defoliate branchlets sometimes simulating large, complex panicles), 5–11 (–14) cm. long, the pedicels 5–25 mm. long, articulated and bibracteolate near base (when young) or near middle (at maturity); flowers fragrant; calyx red-tinged, the lobes rounded or obtuse, 2–2.5 × 1.5–2 mm., slightly accrescent and subpersistent in fruit, the calycine gland conspicuous, 2–3 mm. long, concave; petals pink-tinged to pale purple, copiously short-sericeous without, suborbicular, finely erose-fimbriate, the largest ones to 12 × 8 mm.; filaments greenish white, the longest one stout, 6–10 mm. long, the others



slender, 1.5–3 mm. long, the anthers yellow, 1–1.3 mm. long; style greenish white, 7–11 mm. long; fruits pink to red, the wings lanceolate to obovoid or oblong, variable in shape and size, the largest ones up to 4 × 1.5 cm., the dorsal crest prominent and often nearly as large as smaller wings. Flowers have been observed in April, May, and September to December, fruits in June and October to December.

TYPIFICATION: The material referred by Gray to *Hiptage myrtifolia* was from Ovalau and Vanua Levu, but it is not now possible to tell the locality of individual specimens. Gray's var. α, presumably representing his principal concept of the species, is based on *U. S. Expl. Exped.* (US 14050 HOLOTYPE; putative ISOTYPES at GH, K); var. β, with somewhat larger and thinner leaf blades, is represented by *U. S. Expl. Exped.* (US 14049, GH, K). No reasons are apparent for the maintenance of infraspecific taxa. The source of Gray's concept of *H. javanica* was *U. S. Expl. Exped.* (GH, NY, US), from "Somu-somu and Naiau" (i. e. Taveuni and Nayau). As noted in 1950, I believe these specimens to fall into a reasonable concept of the Fijian endemic.

DISTRIBUTION: Endemic to Fiji and now known from about 35 collections from seven islands, including some in the Lau Group.

LOCAL NAMES: Recorded names, none widely known, are *wa tambua, tumbu ni vono,* and *nungairangawa.*

REPRESENTATIVE COLLECTIONS: VITI LEVU: MBA: Vicinity of Nalotawa, eastern base of Mt. Evans Range, *Smith 4466;* vicinity of Nandarivatu, *Gillespie 4268.* SERUA: Hills between Navua River and Wainiyavu Creek, near Namuamua, *Smith 9013.* NAMOSI: Vicinity of Namosi, *Gillespie 2647;* Nambukavesi Creek, *DA 13840.* NAITASIRI: Nasauvere, Wainimala River, *DA 14026;* vicinity of Nasinu, *Gillespie 3559.* TAILEVU: Near Londoni, *DA 1073.* VITI LEVU without further locality, *Graeffe s. n.* (K, cited as no. *18* by Seemann, 1865). VANUA LEVU: MATHUATA: Near Mbatiri, Ndreketi River, *DA 13581;* vicinity of Lambasa, *Greenwood 506.* THAKAUNDROVE: Nakoroutari, south of Lambasa, *DA 15236.* VANUA MBALAVU: Northern limestone section, *Bryan,* Sept. 20, 1924. KATAFANGA: Northern end of island, *Bryan 541.* FIJI without further locality, *Storck s. n., Horne 949.*

The closest relative (Jacobs, 1955) of *Hiptage myrtifolia* is *H. luzonica* Merr., of the Philippines and Celebes; the Fijian species differs in its very short petioles, its more distinctly ovate and duller leaf blades with obtuse to acute (only rarely somewhat acuminate) apices, and its fruits with a very obvious dorsal crest (very rarely absent), which is always lacking in *H. luzonica.* Gray's original description and illustration can scarcely be improved upon, except that the disparity of filament length is generally greater than indicated by his illustrator.

2. TRISTELLATEIA Thou. Gen. Nov. Madagasc. 14. 1806; Niedenzu in Pflanzenr. **91** (IV. 141): 57. 1928; Jacobs in Fl. Males. I. **5:** 136. 1955; Hutchinson, Gen. Fl. Pl. **2:** 584. 1967.

Lianas, usually glabrous, the stipules small, connate to base of petiole; leaves opposite or verticillate, the blades entire, usually with 2 marginal glands at base; inflorescences terminal and lateral, racemiform or paniculiform; flowers essentially actinomorphic, ☿; calyx eglandular or with very small glands; petals long-unguiculate, oblong or ovate, entire, dorsally carinate; stamens with unequal filaments connate at base, those of the outer whorl the longer and basally the broader; ovary

FIGURE 181. *Hiptage myrtifolia;* A, distal portion of branchlet, with foliage and inflorescences, × 1/3; B, flower, showing calycine gland (g), the petals beginning to separate, disclosing 2 slender, posterior filaments, × 6; C, flower with petals and 6 anthers fallen, showing calycine gland (g), style (s), and filaments of varying lengths, the anterior one (f) much exceeding the others, × 6; D, inner surfaces of 2 petals, the upper one an outer petal, the lower one an inner (posterior) petal with 2 basal outgrowths, × 6; E, flower with petals and 2 sepals removed, showing calycine gland (g), ovary (o) with incipient, copiously pilose wings (w), style (s), and filament (f) of large stamen, × 6; F, ventral and lateral views of fruit, showing the dorsal crest (c) developing longitudinally on the largest wing, × 1. A from *DA 13840,* B–E from *Smith 9013,* F from *Gillespie 3559.*

globose, with 1 (or 2) styles developing, the others abortive; fruit a samaroid mericarp with a coriaceous lateral wing, this with 4–10 lobes stellately expanding in one plane, a median wing sometimes also developing and resembling lobes of the lateral wing.

TYPE SPECIES: *Tristellateia madagascariensis* Poir. (vide Morton in Taxon **17:** 324. 1968); ING (1979) indicates the type species as "non designatus."

DISTRIBUTION: East Africa and (mostly) Madagascar, with one paleotropical species from southeastern Asia to New Caledonia, with about 22 species. One species is occasionally cultivated in Fiji.

1. **Tristellateia australasiae** A. Rich. in Dumont d'Urville, Voy. Astrolabe, Atlas, *t. 15.* 1833, Sert. Astrolab. 38 (descr., as *T. australis*). 1834; Seem. Fl. Vit. 29, as *Tristellaria australasica.* 1865; Niedenzu in Pflanzenr. **91** (IV. 141): 60. 1928; Jacobs in Fl. Males. I. **5:** 136. *fig. 8.* 1955; Fosberg in Micronesica **2:** 147. 1966; J. W. Parham, Pl. Fiji Isl. ed. 2. 174, as *T. australis.* 1972.

Tristellateia australasiae, sparingly cultivated near sea level in Fiji, is a liana or climbing vine with yellow petals; the filaments are also yellow but turn dark red. The only available collection was flowering in January.

TYPIFICATION: Richard mentioned the plant as coming from "port Dorey à la Nouvelle-Guinée," presumably Dore Baai, Vogelkop Peninsula, West New Guinea.

DISTRIBUTION: Southeastern Asia and Formosa through Malesia to the Caroline Islands, New Ireland, Queensland, and New Caledonia; cultivated elsewhere, in the Pacific at least in the Society Islands and Hawaii. It is presumably a fairly recent introduction into Fiji. Seemann (1865) mentioned only a Barclay collection from New Ireland.

LOCAL NAME AND USE: This very attractive ornamental is locally known as *shower of gold climber.*

AVAILABLE COLLECTION: VITI LEVU: REWA: Suva, in private garden, *DA 16094.*

3. GALPHIMIA Cav. Icon. Descr. Pl. **5:** 61. 1799; Niedenzu in Pflanzenr. **94** (IV. 141): 590. 1928; Jacobs in Fl. Males. I. **5:** 144. 1955.

Thryallis L. Sp. Pl. ed. 2. 554. 1762; Hutchinson, Gen. Fl. Pl. **2:** 573. 1967. Nom. rejic. vs. *Thryallis* Mart. (1829, nom. cons.).

Shrubs, the stipules connate at base of petioles; leaves opposite, the blades entire, with 2 small glands at base; inflorescences terminal and axillary, racemose; flowers ☿, essentially actinomorphic; calyx usually eglandular; petals unguiculate, entire or crenulate; stamens with filaments free or very shortly connate at base, alternately slightly unequal; ovary subglobose, 3-lobed, often with 1 or 2 of the locules undeveloped, the styles free, subulate or filiform, coiled in bud; fruits smooth, the mericarps not winged, dehiscent.

LECTOTYPE SPECIES: *Galphimia glauca* Cav. (vide Cuatrecasas in Webbia **13:** 550. 1958; Morton in Taxon **17:** 318. 1968); ING (1979) indicates the type species as "non designatus." For a clarification of conservation of the name *Thryallis* Mart. over *Thryallis* L., cf. Taxon **16:** 76. 1967, op. cit. **17:** 328. 1968.

DISTRIBUTION: America from southwestern U. S. to Argentina, mostly in Mexico, with 10–12 species, one of which is widely cultivated.

1. **Galphimia gracilis** Bartling in Linnaea **13:** 552. 1839; Niedenzu in Pflanzenr. **94** (IV. 141): 595. 1928; Jacobs in Fl. Males. I. **5:** 144. *fig. 14.* 1955; J. W. Parham, Pl. Fiji Isl. ed. 2. 173. 1972.

Galphimia glauca sensu Merr. Fl. Manila, 277. 1912; J. W. Parham in Agr. J. Dept. Agr. Fiji **29:** 32. 1959; Sykes in New Zealand Dept. Sci. Indust. Res. Bull. **200:** 111. 1970; non Cav.
Thryallis glauca sensu Merr. Enum. Philipp. Fl. Pl. **2:** 383. 1923; et auct.; non Kuntze.

Shrub 1–3 m. high, in Fiji occasionally cultivated near sea level; the petals and filaments are bright yellow, the latter becoming red. Flowers have been noted in March and November.

TYPIFICATION: The type was from a plant cultivated in the Botanical Garden at Göttingen, originally from Mexico.

DISTRIBUTION: Mexico and Central America, now widely cultivated in other tropical areas; in the Pacific it has been obtained at least in the Mariana Islands, New Caledonia, Samoa, Niue, the Cook and Society Islands, and Hawaii, as well as in Fiji.

LOCAL NAME AND USE: The *shower of gold* is a very attractive garden ornamental.

AVAILABLE COLLECTIONS: VITI LEVU: REWA: Suva Botanical Gardens, *DA 12096;* Suva, along street, *DA 12270;* Suva, in private garden, *DA 16776.*

4. MALPIGHIA L. Sp. Pl. 425. 1753; Niedenzu in Pflanzenr. **94** (IV. 141): 611. 1928; Jacobs in Fl. Males. I. **5:** 144. 1955; Hutchinson, Gen. Fl. Pl. **2:** 576. 1967.

Trees or shrubs, the stipules small, subulate, eglandular; leaves opposite, the petioles short, the blades entire or spinose-dentate, eglandular; inflorescences axillary and terminal, fasciculate or racemiform, sometimes 1-flowered; flowers ☿, zygomorphic; calyx 6–10-glandular; petals unequal, unguiculate, glabrous, fimbriate to entire; stamens shorter than petals, 2 opposite in a transverse plane different from the other 8, the filaments connate at base; ovary glabrous, 3-locular, the styles free, divergent, the posterior one usually abortive; fruit a fleshy drupe composed of 3 pyrenes, these subcoherent, dorsally costate.

LECTOTYPE SPECIES: *Malpighia glabra* L. (vide Small in N. Amer. Fl. **25:** 152. 1910), one of Linnaeus's six original species.

DISTRIBUTION: America from southwestern U. S. to Peru, mostly in Central America, with 25–35 species, of which two have been cultivated in Fiji.

KEY TO SPECIES

Small, compact shrub usually less than 2 m. high; leaves often fasciculate, the blades ovate, 0.5–4 × 0.5–2.5 cm., rounded at base, the larger ones spinose-dentate at margin; pedicels 1.2–2 cm. long; petals white to pale pink, 8–12 mm. long; fruits composed of 1 or 2 mericarps or pyrenes 0.7–1 cm. long. 1. *M. coccigera*

Shrub or small tree usually 3–7 m. high; leaves not fasciculate, the blades elliptic, 2.5–7.5 × 1.3–3.5 cm., obtuse to rounded or retuse at apex, entire at margin; pedicels 5–10 cm. long; petals pink, about 8 mm. long; fruits fleshy, 1–2 cm. in diameter, with sour, edible pulp and separable pyrenes. 2. *M. punicifolia*

1. **Malpighia coccigera** L. Sp. Pl. 426. 1753; Niedenzu in Pflanzenr. **94** (IV. 141): 635. *fig. 44, K, L.* 1928; Jacobs in Fl. Males. I. **5:** 145. *fig. 15, 16.* 1955; J. W. Parham, Pl. Fiji Isl. ed. 2. 174. 1972.

Shrub 0.3–2 m. high, with stiff branches, infrequently cultivated in Fiji near sea level. The petals are white to pale pink and fimbriate, the anthers are yellow, and the fruits vary from red to orange. Flowers and fruits were observed in March.

TYPIFICATION: The only reference indicated by Linnaeus was to Plumier, Nov. Gen. 46. 1703.

DISTRIBUTION: West Indies; cultivated elsewhere in tropical areas, although in the Pacific I have seen collections only from the Mariana Islands and Hawaii in addition to Fiji, where presumably it was a recent introduction.

LOCAL NAME AND USE: Sometimes known as *Singapore holly* (not recorded in Fiji), *Malpighia coccigera* is an attractive, compact ornamental, said to form good hedges.

AVAILABLE COLLECTION: VITI LEVU: REWA: Lami, in private garden, *DA 16449.*

2. **Malpighia punicifolia** L. Sp. Pl. ed. 2. 609. 1762; Niedenzu in Pflanzenr. **94**(IV. 141): 622. 1928; J. W. Parham, Pl. Fiji Isl. 122. 1964, ed. 2. 174. 1972.

Shrub or small tree to 7 m. high, with a trunk to 10 cm. in diameter, introduced into cultivation in Fiji for experimental purposes. The pink petals are fimbriate, and the fruits are subglobose, sulcate, 1–2 cm. in diameter, and red to scarlet. No herbarium material has been located from Fiji.

TYPIFICATION: A number of earlier references were listed by Linnaeus.

DISTRIBUTION: Southern Mexico to Peru and also in the West Indies; often cultivated elsewhere.

LOCAL NAMES AND USES: Introduced into Fiji as *acerola,* the species is also widely known as *West Indian cherry* or *Barbados cherry.* The fruits are edible raw or preserved and are one of the richest sources of vitamin C; the pressed, dried fruit pulp has been used commercially as such a source. The species is also sometimes used as a garden ornamental.

Malpighia punicifolia is sometimes considered a synonym of *M. glabra* L. (1753) (cf. Purseglove, Trop. Crops, Dicot. 637. 1968; Cronquist, 1981, p. 770), but Niedenzu placed the two taxa in different subgenera, and they are well distinguished by Little, Woodbury, and Wadsworth, *Trees of Puerto Rico and the Virgin Islands* **2:** 372, *fig. 422,* vs. 380, *fig. 426.* 1974. In the absence of herbarium material one may assume that the plant introduced into Fiji as *acerola,* experimentally for its high vitamin C content, was correctly referred to *M. punicifolia* by Parham.